IGX

This chapter provides information on the StrataCom integrated gigabit switch (IGX). The information is organized into the following sections:

- Product Overview
- Standard Features
- Product Numbers

Note Documentation for the IGX is available in two forms: on a CD-ROM called Cisco Connection Documentation, Enterprise Series and printed books. You can request a free copy of the documentation CD when you place an order and have the option of subscribing to a CD update service.

You can also access Cisco technical documentation on the World Wide Web URL http://www.cisco.com. For more information, see the chapter "Documentation" at the end of the catalog.

Product Overview

The IGX is a standards-based, scalable ATM switch. Highly versatile, the IGX supports a wide range of narrowband and broadband applications for enterprise networks and public service providers. The IGX provides the same core ATM capabilities and advanced networking features of the BPX/AXIS.

The IGX is available with 8-, 16-, or 32-slot configurations allowing you to add capacity as demand increases without facing high equipment replacement costs. In a multiservice public ATM environment, you can cost-effectively launch new services and expand system capacity as market demand grows. The IGX lets you migrate from narrowband speeds to broadband ATM on the same platform providing unmatched WAN investment protection.

The IGX switch represents a new generation of ATM switches specifically developed to deliver the benefits of ATM today for new applications, while seamlessly replacing legacy systems. Today, the IGX difference is its ability to provide functional equivalence to legacy systems, provide high-speed, high-performance new interfaces, and operate in a

private or hybrid ATM environment. Tomorrow its ability to migrate to as yet unwritten standards and operate in a ubiquitous public ATM environment will prevent still another platform change and maintain today's investment.

The IGX product family consists of the IGX 16 and IGX 32 multiservice ATM switches. As true members of the STRATM portfolio, IGXs seamlessly integrate with IPX, BPX, AXIS, Fulcrum INS, EdgeConnect and FastPAD platforms under StrataSphere management, to provide multiband ATM solutions from the access to the core layer with integrated network management and call processing.

The IGX 16 and IGX 32 are network backbone node systems for large sites with multiple trunks and considerable local traffic requirements, where a large number of physical ports and gigabit-scale throughput are required. Both IGX systems are available as stand-alone units or can be rack-mounted with other equipment.

System Architecture

The IGX uses a 1.2-Gbps cell switching redundant bus to pass ATM cells between optionally redundant adaptation, trunking and gateway modules within the system. This architecture allows any amount of bandwidth to be assigned to any slot, and makes the IGX the only system in its class with more than 16 slots for greater scalability.

Hardware, firmware and software are architected for maximum availability, non-stop networking, even during maintenance windows. Availability design features, common to all switching systems, include the following:

- 100percent component redundancy
- Extensive background diagnostics
- "Hot" card swapping
- Rapid power fail recovery
- Background software download
- Firmware, not hardware, upgrades (remote download)
- Class B EMI certified enclosures
- Hard and soft alarm interfaces, including "call home"
- Minimum internal cabling
- Integrated grounding wrist straps

All switches use a midplane design with front cards performing processing functions and back cards providing interfacing and physical connectivity. This allows most system maintenance to be performed at the front cards, without disconnecting interface cables.

Standard Features

The IGX includes the following features:

- Networking features
- Voice services
- Circuit switched data services
- Frame Relay services
- ATM services
- Internetworking services
- Trunk resources
- Enterprise backbone networking solutions
- VAN service solutions

Networking Features

The common ATM architecture throughout the product line provides common multiband/ATM network-wide support for advanced networking features, including the following:

- OptiClass–class of service features

  The ability to support multiple user services on a single switching network and share bandwidth among them is one of the greatest attractions of an ATM-based switching architecture. OptiClass provides the control and predictability necessary to offer many variants of ATM services, and makes systems the only ATM platforms proven to maintain delay and throughput in mixed traffic environments through large, complex network topologies.

- AutoRoute–connection management

  AutoRoute is a connection management mechanism designed to simplify the management of the huge numbers of connections in ATM system. AutoRoute avoids laborious configurations, management of endless tables, or the systems having to refer to a network management station before re-routing connections. AutoRoute intelligently routes new connections within the ATM network based only on the class of service, connection type, size and endpoints. It also intelligently reroutes connections around trunk and hardware failures quickly.

- ForeSight–traffic management and congestion avoidance

  ForeSight is a standards-based proactive traffic management and congestion avoidance mechanism. It enables up to 95 percent utilization of network bandwidth, compared with the 50 percent to 70 percent utilization experienced when open-loop mechanisms are used alone in non-ForeSight ATM and frame-switching systems.

  ForeSight is a rate-based, closed-loop feedback mechanism that continuously monitors the utilization of trunks and adjusts the bandwidth of all virtual connections accordingly. It ensures maximum bandwidth to all connections while proactively

avoiding the possibility of queuing delays and cell discard. ForeSight is the industry's first implementation of the new rate-based traffic management specification defined by the ATM forum.

- Voice Activity Detection (VAD)–ATM voice adaptation

  VAD uses the latest digital signal processing techniques to distinguish between silence and speech on a voice connection. VAD only generates traffic (cells) onto the network during speech, and so typically achieves at least a 2:1 saving. This is possible because most voice conversations are 60percent silence; we listen while the other person speaks and we pause between sentences. Together, ADPCM and VAD over ATM achieve up to 8:1 savings over uncompressed voice traffic.

- Repetitive Pattern Suppression (RPS)–Circuit Data Compression

  RPS increases efficiency of data connections up to 128 Kbps. This algorithm effectively compresses data by up to 4:1 times by removing repetitive patterns such as "7E" flags sent by devices when they have no new traffic. Repetitive patterns are reproduced at the far end of RPS connections, so connected devices remain unaffected.

Voice Services

Voice Over ATM

IGX systems provide efficient, high-quality voice connectivity to most PABX types through standard interfaces. The IGX is the industry's first ATM switch with voice over ATM using both voice compression and silence suppression (VAD).

ITU Standard ADPCM Voice Compression

Mathematically compresses voice signals for two- to four-fold savings over uncompressed voice traffic. When combined with VAD, up to 8:1 compression can be achieved. Echo cancellation is also integrated.

Standard Voice Switching

Between PBXs using standard common channel signaling protocols including Q.SIG and DPNSS can be achieved in conjunction with the Fulcrum INS integrated network call processing server. With this feature, each voice channel is dynamically routed on a per-call basis, and advanced PBX features such as transfer and camp-on are extended across the network, even if trunking is achieved through an ATM cloud.

Fax and Modem Services

IGX voice services support facsimile and modem communications transparently by disabling or stepping-down compression. As with voice transmission, this technique ensures efficient, high-quality transmission.

Voice Service Modules

- CVM Module
- ADPCM compression
- VAD
- Digital interfaces
- T1/E1/Y1(Japanese) interfaces
- Optional call switching

Circuit Switched Data Services

Transparent Circuit Emulation Over ATM

IGX systems provide circuit switched data connectivity for legacy data transport through transparent, fixed delay, fixed throughput, zero discard point-to-point data connections over ATM. Speed options range from 1200 bps to 1.344 Mbps (Async. from 1.2 Kbps to 19.2 Kbps) using standard RS232, V.35, X.21, T1 and E1 interfaces. The IGX supports both dedicated port and channelized circuit emulation (from voice service circuit interfaces).

Flexible Clocking Through ATM

Includes options for external or internal clocking on a port-by-port basis. Also, the "software break-out box" feature allows the EIA control leads on any data port of any node in the network to be viewed and manipulated in real time from the StrataView Plus network management console.

Circuit Switched Data Service Modules

- LDM Module
  - RS-232
  - Up to 19.2 Kbps per port
  - Up to 8 ports
  - Async/Sync
- HDM Module
  - V.35, X.21, V.36, RS-449, RS-422
  - Up to 1.344 Mbps per port
  - Up to 4 ports
  - Sync

- CVM Module
  - Channelized data input
  - Up to 8 X DS0 per bundle
  - DS0(A)

Frame Relay Services

Standards-compliant frame relay services from IGX systems achieve high throughput, low delay, low discard, connectivity for LAN interconnect and legacy FRAD traffic. Port speed options range from 56 Kbps to 2.048 Mbps. Standard interfaces include V.35, X.21, channelized T1 and channelized E1, for up to 31 logical ports per physical port.

Fully Standards-compliant

All IGX frame relay port types conform to all aspects of the non-switched frame relay services (PVC services) defined in ANSI T1 .606/.607/.618 and CCITT I.122/Q.933 standards, and support a full implementation of the Local Management Interface (LMI) and enhancements incorporated in ANSI & ITU standards. DE, FECN and BECN bit handling conforms with all standard definitions. SVCs and ISDN access are supported in conjunction with the Fulcrum INS call processing server.

Fair, High Performance

All IGX frame relay port types support ForeSight traffic management and congestion avoidance algorithm and FairShare user firewalling with per-VC queuing and rate scheduling for high performance and management of fairness among users.

Seamless Interworking

All IGX frame relay ports seamlessly interwork with IGX, BPX and AXIS ATM ports. IGX is the industry's only platform which utilizes the traffic management technology specified by the ATM forum to ensure true, seamless interworking. Interworking connections support ForeSight traffic management and congestion control, and FairShare user firewalling.

Integrated FRAD Ports

IGX frame relay ports support an integrated FRAD or frame forwarding capability for efficient transport of SDLC-framed traffic over frame relay on all port types at speeds up to 2.048 Mbps. Like RPS for clear channel data, frame forwarding does not generate ATM cells into the network when no new frames are present. This saves otherwise wasted bandwidth resources.

Frame Relay Service Modules

- FRM Module
  - Up to 2 Mbps/port
  - V.35, X.21, V.36, RS 449 X 4
  - T1/E1 X 1
  - Clear channel or channelized input

ATM Services

Broadband Connectivity

Standards-compliant ATM services from IGX systems support high-performance, CBR, VBR and ABR connections with their associated classes of service. Standard interfaces include OC3, T3/E3 and T1/E1.

Fully Standards-compliant

All IGX ATM port types conform to all aspects of ATM services defined in ANSI and ITU standards and ATM forum specifications, and support a full implementation of ATM UNI version 3.1, together with the emerging PNNI interface. CLP bit handling conforms with all standard definitions. ATM SVCs are supported in conjunction with the Fulcrum INS call processing server.

Fair, High Performance

All IGX ATM port types support ForeSight traffic management and congestion avoidance algorithm and FairShare user firewalling with per-VC queuing and rate scheduling for high performance and management of fairness among users.

Seamless Interworking

All IGX ATM ports seamlessly interwork with IGX, IPX and AXIS frame relay ports. IGX is the industry's only platform which utilizes the traffic management technology specified by the ATM forum to ensure true, seamless interworking. Interworking connections support ForeSight traffic management and congestion control, and FairShare user firewalling.

ATM Service Modules

- UAM Module

- ATM UNI version 3.1, PNNI
- OC3/STM1, T3/E3, T1/E1 interfaces
- CBR, VBR, ABR services

Internetworking Services

High-speed LAN Connectivity

IGX systems are the optimal solution for switching high-speed internetworking traffic in the campus, MAN and WAN environment. However, in most applications, routers are already in place and so internetworking connectivity is achieved using frame relay or ATM interfaces. Yet, as users migrate to virtual LANs and LAN emulation, performance beyond that of routers is required to achieve true OC3 speed throughput. For this application, the IGX supports the EdgeConnect high-speed Internetworking device for seamless, high-performance internetworking over ATM.

Price/Performance

The EdgeConnect provides higher throughput, up to 155 Mbps speeds, than high-end router systems at a fraction of their cost.

Full Interworking

The EdgeConnect supports multiprotocol routing of IP, IPX, AppleTalk and XNS along with full bridging to facilitate seamless interworking with other vendors' devices at smaller sites with devices already installed.

Fair, High Performance

EdgeConnect internetworking connections over both frame relay and ATM support ForeSight traffic management and congestion control, and FairShare user firewalling.

Internetworking Service Modules

- EdgeConnect
  - Ethernet, Token Ring, FDDI
  - OC3, T3/E3, T1/E1 interfaces
  - Frame Relay and ATM connectivity
  - Multiprotocol Routing
  - IP, IPX, XNS, AppleTalk

— RIP, OSPF, EGP, BGP, RTMP

— Transparent and translational bridging

— PPP

Trunk Resources

ATM Switching & Transmission

All IGX services are supported onto standard ATM narrowband and broadband trunk resources. The IGX's system supports a wide variety of networking options including multipoint logical trunking through public ATM services for seamless hybrid networking. IGX systems support trunk speeds from 128 Kbps to OC3 and FastPAD access trunk connectivity from 9.6 Kbps to 2 Mbps. IGX systems can be fully interconnected in a logical mesh through public ATM services, or provide edge switching in and out of such services, and can hybrid network to FastPAD systems over public frame relay services at up to 2 Mbps. IGX systems also support the IPX FastPacket trunk protocol for seamless connectivity with IPXs at smaller sites.

Multipoint Logical Trunking

Multipoint logical trunking allows multiple virtual trunks to be configured over a single ATM access line. Logical trunks between two destinations can be configured as CBR, VBR or ABR, and the IGX will route the appropriate traffic types through them. A single access line can support multiple logical trunks to multiple destinations.

As attractively tariffed ATM services become available, IGX systems enable virtual trunking through them, and provide the following benefits:

- Efficiency

  The IGX's ATM architecture does not dedicate valuable trunk bandwidth to particular connections. Instead, it dynamically assigns bandwidth to services as needed.

- Reliability

  Since fixed bandwidth is not assigned, network management traffic does not use excessive bandwidth during normal operation, yet can burst instantaneously to high speed upon network reconfiguration due to trunk failure. This gives systems the fastest rerouting capability in the industry.

- Standards

  IGX systems support fully standard, public service-compatible 53-byte cell ATM trunking at all trunk speeds. Multipoint capability further allows logical trunking to multiple destinations over a single public ATM service connection.

Networking Resource Modules

- NTM (for IPX connectivity)
  - T1, E1, Y1 and subrate
  - Fractional
- BTM
  - E3, T3, T2, 6 Mbps
  - Fully CCITT ATM-compliant
  - Multipoint
  - ATM Service compatible
- FTM
  - FastPAD connection
  - Up to 512 Kbps per FastPAD
  - Frame Relay Service compatible
- UTM
  - OC3, STM1, T3, E3, T1, E1, T2, HSSI and subrate
  - Fully CCITT ATM-compliant
  - Multipoint, fractional
  - ATM Service compatible

Enterprise Backbone Networking Solutions

Bandwidth-hungry LAN interconnect traffic is rapidly increasing as applications are becoming more distributed and complex. PCs are becoming more and more powerful. And LAN switching is bringing greater bandwidth to individual desktops. The wide area is increasingly the bottleneck in the enterprise environment. Legacy WAN systems such as TDMs, frame switches and switching routers cannot provide the efficiency of throughput required over existing infrastructure to achieve the required performance improvement.

Enterprise networks have, to date, been built with Subrate, T1 and E1 circuits. With further international deregulation, and the global shift towards fiber-optic transmission, particularly in metropolitan areas, the number of services available to build an enterprise infrastructure has increased dramatically. And again, the legacy systems such as TDMs, frame switches and switching routers just don't have the throughput or interfaces to take advantage of dark fiber in the cities, or ATM services in the wide area.

The IGX is the ideal solution to improve efficiency over existing infrastructure and take advantage of new services; it provides the performance advantages of ATM together with the interfaces and complex networking software to mix and network existing traffic with emerging traffic. And IGX has the capacity to support all projected user requirements, which makes IGX a safe investment into the future with ATM.

Seamless Hybrid Networking with IGX

The IGX ATM architecture, including multipoint ATM trunking, allows users to take advantage of attractively tariffed WAN services available from OC3 speed leased lines to T1/E1 ATM services for a complete, seamless hybrid networking solution.

StrataCom's product line of FastPAD, EdgeConnect, IPX, IGX and BPX, along with Fulcrum INS and StrataSphere network management, provides a complete wide area solution with growth capability for the foreseeable future and seamless interworking from low-speed access to a broadband OC12 core.

A Future in the ATM World

ATM will gradually become ubiquitous such that networks can be completely "logical," with all nodes virtually connected to each other. With multipoint virtual trunking today, IGX guarantees your future in the ATM world.

VAN Service Solutions

ATM presents carriers and VANs with the opportunity to provision emerging services such as frame relay and low speed ATM, together with existing services such as X.25, SNA and Internetworking, over a common, more efficient infrastructure. IGX is the ideal solution for the VAN service provider as it provides a mix of service interfaces and access interfaces for legacy service equipment, and addresses the key issues of resource efficiency and multivendor service management. IGX delivers the same service attributes as the BPX-AXIS combination, together with narrowband trunking capabilities. And IGX provides sufficient capacity for most service locations, passingoff to the BPX-AXIS combinations as throughput requirements grow to exceed 1.2 Gbps.

IGX and Frame Relay Services

 is the largest supplier of frame relay service equipment to carriers and VANs globally. In many countries, multiple -based services compete but are able to differentiate based on the many configurable service parameters available on platforms. The IGX is fully interoperable with the BPX/AXIS systems used at larger sites and by medium and large carriers, and provides full frame relay to ATM service interoperability.

All -based frame relay services are differentiated from others by one key attribute: performance. frame relay services provide lower delay, higher throughput and lower discard rates than any alternatives, while allowing the service provider to deterministically oversubscribe provisioned bandwidth by a much higher ratio, the key advantage of frame switching over cell switching.

IGX and X.25 Services

brings significant performance improvements to many of the world's X.25 networks today. This can be achieved with the IGX using the frame relay protocol trunk option available for many types of X.25 service switches. Logical full-mesh PVC connectivity between X.25 nodes using frame relay interconnectivity with ForeSight eliminates the store-and-forward transit packet delays, streamlines the internodal protocols, and allows provisioned trunk bandwidth to be operated at much higher utilization. Carriers and VANs have achieved 30 percent to 35 percent reduction in delay, 30 percent reduction in equipment costs and a 30 percent reduction in provisioned bandwidth using this technique.

IGX and Legacy VAN Services

The performance and cost savings benefits of ATM can be achieved for legacy VAN services such as SNA and EDI using the frame forwarding and circuit switched data capabilities of the IGX. Frame forwarding allows any SDLC based data to be transported point to point with the same efficiency and ForeSight congestion avoidance as Frame Relay traffic. And circuit switched data channels can be compressed using RPS at connection speeds up to 128 Kbps for up to 8:1 savings.

IGX for the VAN

The small footprint, rack mount capability, remote diagnostics and AC or DC power options of the IGX make it the ideal VAN service platform where many locations are actually rented from third parties and not constantly manned by VAN personnel. Homologated worldwide and support by StrataCom's direct or third-party maintenance partners, it can quickly be deployed to virtually any national or global service location. And with multipoint ATM service trunking capabilities, the IGX will allow VANs to take advantage of attractively tariffed ATM services as they emerge.

StrataSphere ATM Management

ATM systems present a whole new set of challenges to network management environments. ATM networks are faster, support an order of magnitude for more connections, and have access to more usage data than any previous types of systems. For the enterprise and VAN user, ATM networks can be expensive to operate if overprovisioned, and are complex to design as each connection's use of provisioned bandwidth is calculated taking utilization into account.

StrataSphere is the industry's first robust, scaleable management environment for ATM systems. As such, it is designed to address the major issues surrounding network management, which must be addressed for ATM deployment:

- Cost allocation

  As the costs of higher speed wide area networks increase with bandwidth, so there is greater demand within enterprises and VANs for cost justification and allocation to those users actually utilizing the bandwidth.

- Network administration

  ATM's more complex environment, greater number of connections, and wide variety of services make network administration a potentially impossible task.

- Resource planning

  ATM networks are complex to design, analyze, maintain, and plan for.

Scalability

Cost allocation, network administration, and resource planning issues all relate to the scalability requirement for ATM network management. Common to the product portfolio, StrataSphere is designed to scale from the few node user to the multithousand node carrier service network, and specifically addresses these key issues.

Management Architecture and Standards

StrataSphere revolves around a TMN-compatible structured architecture optimized for scalable ATM system management. First, a significant amount of intelligence is distributed to the elements themselves, allowing fast, distributed rerouting and real-time service quality management. Elements collect and archive granular historical statistics (not simple counters), and provide standard, open interfaces to information. Interface protocols extend beyond SNMP, which is too real-time intensive and has excessively high overhead, to TFTP, which is optimized for bulk data transfer, and can upload one million usage statistics per hour per management station. StrataSphere also supports Telnet for direct nodal access.

Element and network management functions are provided by the StrataView Plus system, which can manage all network elements seamlessly. StrataView Plus in turn provides open interfaces for other StrataSphere tools, and for higher level service management processes.

StrataSphere Tools

StrataSphere BILLder provides standard billing record generation for usage-based billing applications. Formats supported include Bellcore AMA. StrataSphere Modeler and Optimizer are sophisticated network modeling and analysis tools for ATM system design and incremental design. Modeler includes the capability to upload a live network configuration model from StrataView Plus, and Optimizer includes a documented, open API for integration with third-party design tools and tariff databases.

StrataView Plus: Resource Management and Control

StrataView Plus provides a new level of management capabilities for efficient, productive management of communications resources. The industry's first resource manager for ATM environments, StrataView Plus, can manage all aspects of the smallest access networks and the largest Multiband ATM networks. It collects extensive traffic statistics, provides

open interfaces to this information, and continuously monitors network resource performance. For logistics management, it provides powerful remote viewing, diagnostic, control, and maintenance capabilities.

Open Management

StrataView Plus provides seamless element and network management for the complete product portfolio, including IGX. Operating within the HP OpenView and IBM NetView multivendor management environments, StrataView Plus supports a suite of open interfaces for access to management information, including the following:

- Standard management integration protocols interfaces, including SNMP
- SQL access to the Informix relational traffic database
- X-terminal access for multiple operators into StrataView Plus management agents
- Craft interface for terminals and simple tools

ATM system management can be integrated within the multivendor environment using third-party applications in conjunction with the StrataView Plus application. Otherwise, integration management interfaces and software tools can achieve fault, configuration, performance and security management through the open management interfaces.

Connection Management

Connection management will perhaps be the most challenging issue in ATM system management; ATM systems support so many connections that it can become impossible to administer and manage them. The StrataSphere Connection Manager leverages StrataCom's extensive customer experience in ATM system management, and provides intuitive forms/menus-based connection configuration and management. For automated provisioning systems, the Connection Manager also supports an SNMP "Service Proxy" for integration.

Network Partitioning and Customer Network Management

StrataView Plus seamlessly integrates into third-party applications for logical network partitioning and/or customer network management. Several of the industry's popular VPN platforms already support device libraries. Some logical partitioning is also possible through hyperscript-filtered database access using WINGZ.

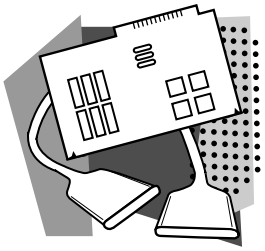
Specifications

Table 232 provides IGX specifications.

Table 232 IGX Specifications

Characteristic	Description
Platforms	IGX 16 16-slot unit, rack mount or free-standing 1.2 Gbps cell switching bus CISPR B EMI certified IGX 32 32-slot unit, rack mount or free-standing 1.2 Gbps cell switching bus CISPR B EMI certified
Power	Distributed 48V DC power conversion on modules 220/240 VAC AC-DC converter, 1:N redundant
Control processors	NPM (Network Processor Module) 68040 CPU SCM system clock module, internal or external clocking
Alarm modules	ARM Alarm Relay module Eight normally open contacts Six normally closed contacts
Voice service sodules	CVM channelized voice and data module 32, 24 and 16 Kbps ADPCM voice compression (ITU G.721, G.723 and G.726) Voice Activity Detection (VAD) Integrated FAX/high-speed modem detection, and echo cancellation Supports T1, E1, Japanese TTC interfaces
Circuit switched data service modules	HDM high-speed data module: Up to 4 channels, each up to 1.344 Mbps Supports RS 232, V.35, RS 422, RS 449, X.21/V.36 interfaces Repetitive pattern suppression to 128 Kbps LDM Low-speed data module: Up to 8 channels, totaling 8x19.2 Kbps Supports RS-232 interface Repetitive pattern suppression to 19.2 Kbps
Frame Relay service modules	FRM Frame Relay module: Up to four channels, totaling 2.048 Mbps Conforms with: CCITT 1.122 (ANSI T1/S1) T1.606—Services description of frame relay bear service T1.606 addendum—Congestion management T1.617 (Annex D)—Signaling specification for frame relay T1.618—Core aspects of Frame Relay Includes fully standard handling of DE, FECN & BECN bits Supports: V.35, RS 422, RS 449, X.21/V.36, and T1/E1 (channelized and nonchannelized) interfaces
ATM service modules	UAM ATM UNI module ITU 53-byte cell standard Supports CBR, VBR, ABR services Supports OC3/STM1, T3/E3, T1/E1 interfaces

Characteristic	Description
LAN service modules	EdgeConnect device Ethernet, Token Ring, FDDI connectivity Supports CBR, VBR, ABR services Supports OC3/STM1, T3/E3, T1/E1 interfaces
Network trunking modules	NTM trunking front module Trunk speeds from 128 Kbps to 2.048 Mbps Supports T1/E1, Japanese Y trunk interfaces BTM broadband ATM trunk module ITU 53-byte cell standard Supports T3/E3 and HSSI interfaces Multipoint logical trunking over ATM service FTM FastPAD trunk module FastDLC, FrameClass, Frame Relay service compatible, protocol FastPAD trunk speeds from 9.6 Kbps to 512 Kbps Supports V.35, T1, E1, X.21 interfaces UTM ATM trunking module ITU 53-byte cell standard Supports OC3/STM1, T3/E3, T1/E1, T2, HSSI and Subrate Multipoint logical trunking over ATM service



Product Numbers

Table 233 lists the product numbers you can use to order IGX products, accessories, and spares.

Table 233 IGX Product Numbers

Description	Product Numbers
IGX Products	
GX 8 , 8 Slot, NPM, SCM	IGX8
IGX 8 Standalone, NPM, SCM	IGX8-SA
IGX 16 , 16 Slot, NPM, SCM	IGX16
IGX16-SA, 16-Slot, NPM, SCM	IGX16-SA
IGX 32, 32 Slot, NPM, SCM	IGX32
IGX32-SA, 32-Slot, NPM, SCM	IGX32-SA
IGX Bundles and Options	
ATM WAN Switch,8-slot,AC,T1 trunk,FR port,T1 voice	IGX8-AC-NR-T1
ATM WAN Switch,8-slot,AC,E1 trunk,FR port,E1 voice	IGX8-AC-NR-E1
ATM WAN Switch,8-slot,AC,Y1 trunk,FR port,J1 voice	IGX8-AC-NR-Y1
ATM WAN Switch,16-slot,2-AC,2-T1 trunk,2-FR port,T1 voice	IGX16-AC-R-T1
ATM WAN Switch,16-slot,2-AC,2-E1 trunk,2-FR port,E1 voice	IGX16-AC-R-E1
ATM WAN Switch,16-slot,2-AC,2-Y1 trunk,2-FR port,J1 voice	IGX16-AC-R-Y1

Description	Product Numbers
Frame Relay Interface (FRI-V.35)	BC-6251B-V35
Frame Relay Interface (FRI-X.21)	BC-6254A-X21
IGX Cabinets	
STRATM - Cabinet	STRATM-CAB
STRATM - Cable Management Option	STRATM-CMGMT
STRATM - Kit of Four Side Panels	STRATM-SP
STRATM - Rear Door	STRATM-RDOOR
STRATM - Stability Plate Option	STRATM-STAB
IGX Processor Group	**IGX Processor Group**
Network Processor Module - 16MB DRAM	IGX-NPM-16
Network Processor Module - 16MB DRAM	IGX-NPM-16=
Redundant Network Processor Module - 16MB DRAM	IGX-NPM-16-R
Network Processor Module - 32MB DRAM	IGX-NPM-32
Network Processor Module - 32MB DRAM	IGX-NPM-32=
SCM with Ethernet & LEC back card.	IGX-SCM
SCM with Ethernet & LEC back card.	IGX-SCM=
IGX Alarm Relay Group	
Alarm Relay Module	IGX-ARM
Alarm Relay Interface (ARI) Back Card	BC-512011
IGX Trunk Groups	
Network Trunk Module for the IGX8	IGX8-NTM
Network Trunk Module	IGX-NTM
Back Card/T1 (BC-T1)	BC-6271A
Back Card/Subrate (BC-SR)	BC-6083A
Back Card/E1 (BC-E1)	BC-6171A
Backcard/Y1 (BC-Y1)	BC-550150
Broadband Trunk Module	IGX-BTM/B
T3 Back Card for Broadband Trunk Module	BC-571110A
E3 Back Card for Broadband Trunk Module	BC-571210A
IGX Port Groups	
High Speed Synchronous Data Module	IGX-HDM
HDM Back Card/RS232D (SDI-RS232D)	BC-5084B
HDM Back Card/V.35 (SDI-V.35)	BC-5082A
HDM Back Card /RS449 (SDI-RS449)	BC-5083A
Low Speed Data Module	IGX-LDM
LDM Back Card/4 Port/RS232C (LDI4)	BC-5286A
LDM Back Card/8 Port/RS232C (LDI8)	BC-5287A
LDM Back Card/4 Port/DDS (LDI4/DDS)	BC-5288A

Description	Product Numbers
Channelized Voice Module ADPCM for the IGX8	IGX8-CVM
CVM ADPCM with integrated T1 echo canceler for the IGX8	IGX8-CVM-T1EC
CVM ADPCM with integrated E1 echo canceler for the IGX8	IGX8-CVM-E1EC
Channelized Voice Module ADPCM for the IGX16 & IGX32	IGX-CVM
CVM ADPCM with integrated T1 echo canceler for the IGX16 & I	IGX-CVM-T1EC
CVM ADPCM with integrated E1 echo canceler for the IGX16 & I	IGX-CVM-E1EC
Back Card/E1 (BC-E1)	BC-6171A
Back Card/T1 (BC-T1)	BC-6271A
Back Card J1 (BC-J1)	BC-550100
Frame Relay Module for the IGX8	IGX8-FRM
Frame Relay Module 6 Channels for the IGX8	IGX8-FRM-6
Frame Relay Module-31 Channels for the IGX8	IGX8-FRM-31
Frame Relay Module for the IGX16 & IGX32	IGX-FRM
Frame Relay Module 6 Channels for the IGX16 & IGX32	IGX-FRM-6
Frame Relay Module-31 Channels for the IGX16 & IGX32	IGX-FRM-31
Frame Relay Module for use with Port Concentrator Shelf	IGX-FRM-2
Frame Relay Interface (FRI-V.35)	BC-6251B-V35
Frame Relay Interface (FRI-T1)	BC-6252A
Frame Relay Interface (FRI -E1)	BC-6253A
Frame Relay Interface (FRI-X.21)	BC-6254A-X21
Frame Relay Interface X.21 backcard for FRM-2 & PCS	BC-6355A
IGX Port Concentrator Shelf	
110V, 44 Port PCS unit with V.28 interfaces	PCS-NA-S-V28
110V, 44 Port PCS unit with V.11 interfaces	PCS-NA-S-V11
110V, 44 Port PCS unit with V.35 interfaces	PCS-NA-S-V35
220V, 44 Port PCS unit with V.28 interfaces	PCS-INTL-S-V28
220V, 44 Port PCS unit with V.11 interfaces	PCS-INTL-S-V11
220V, 44 Port PCS unit with V.35 interfaces	PCS-INTL-S-V35
240V, 44 Port PCS unit with V.28 interfaces	PCS-UK-S-V28
240V, 44 Port PCS unit with V.11 interfaces	PCS-UK-S-V11
240V, 44 Port PCS unit with V.35 interfaces	PCS-UK-S-V35
PCS shelf only with 110VAC power supply	PCS-NA
PCS shelf only with 220VAC power supply	PCS-INTL
PCS shelf only with 240VAC power supply	PCS-UK
PCS module with 1, V.11 & 11, V.28 interfaces	PCS-V28
PCS module with 12, V.11 interfaces	PCS-V11
PCS module with 1, V.11 and 11 V.35 interfaces	PCS-V35
RS232M25 - RS232M25	CABLE-V28

Description	Product Numbers
RS232M25 - X.21/V.11 DB15/M	CABLE-V11
RS232M25 - V.35/M34	CABLE-V35
RS232M25 - V.35/M34	CABLE-SPV35
RS232M25 - RS422/M37	CABLE-X21DTE
RS232M25 - RS422/M37	CABLE-X21DCE
IGX Spares and Accessories	
400W Power Supply Module for the IGX-8	IGX8-PS-AC
Single AC Input Power Option Rack	IGX8-AC1
Dual AC Input Power Option Rack	IGX8-AC2
Single AC 875W Power Supply; single AC input (non-redundant)	IGX16-AC1-1
Dual AC 875W Power Supply; single AC input (redundant)	IGX16-AC2-1
Dual AC 875W Power Supply; dual AC input (redundant)	IGX16-AC2-2
Dual AC 875W Power Supply; single AC input (non-redundant)	IGX32-AC2-1
Quad AC 875W Power Supply; dual AC input (redundant)	IGX32-AC4-2
Additional 875W ACPower Supply for the IGX16 or IGX32	IGX-PS-AC
DC Power Option Non-redundant for the IGX8	IGX8-DC-1
DC Power Option Redundant for the IGX8	IGX8-DC-2
Power Entry Module - DC for the IGX16 & IGX32	IGX-PEM
IGX8 Cooling unit and fan tray	IGX8-COOL=
IGX-16 or IGX-32 Upper Cooling unit	IGX-UCOOL=
IGX-16 or IGX-32 Lower Cooling unit	IGX-LCOOL=
Includes the three required power supply cables for 1 or 2 s	IGX-CABSET=
Exhaust Plenum for the IGX-16 or IGX-32	IGX-PLENUM=
PEM backcard - DC for the IGX-16 or IGX-32	IGX-PEMBC=
SCM/NPM Local (Utility) Bus	IGX-BUS=
IGX Software Licenses	
System Software License 7277 for IGX 16 & 32	IGX-SW-7277
System Software License 7281 for IGX 16 & 32	IGX-SW-7281
System Software License 812 for IGX 8	IGX8-SW-812
IGX Feature Licenses	
Frame Relay ForeSight Software License per T1/E1	IGX-FS-1
RPS Software License for IGX 8	IGX8-LIC-RPS
RPS Software License for IGX 16&32	IGX-LIC-RPS
Priority Bumping Software License for IGX 8,16 & 32	IGX-LIC-PBS
Configuration Save & Restore Software License	IGX-LIC-CSR
Multi-user Configuration Sessions	IGX-LIC-MUC